

- 10040012-110701
1. A method for reducing defect levels in photomasks comprising:
 - providing a photomask having patterned metal layers;
 - treating the photomask to a cleaning process consisting of:
 - a solution of ammonium hydroxide, hydrogen peroxide and water maintained at a constant temperature range;
 - ultrasonic agitation;
 - an exposure time greater than 6 minutes;
 - removing particles and residues greater than about 0.2 microns while removing a minimal amount of patterned metal layer or layers; and
 - exercising the cleaning process on a particular photomask for a multiple number cleaning cycles without degradation of the photomask.
 2. The method of Claim 1 wherein the ratio of reagents ammonium hydroxide:hydrogen peroxide:water of the cleaning solution is from about 1:1:200 to about 1:1:20 respectively by volume.
 3. The method of Claim 1 wherein the minimal amount of metal layer or layers removed during cleaning results in less than 6.3% increase in optical transmission.
 4. The method of Claim 1 wherein the constant temperature range of the cleaning solution is from about 15 degrees centigrade to about 60 degrees centigrade.
 5. The method of Claim 1 wherein the pH of the cleaning solution is maintained at an alkaline level above a value of about 8.
 6. The method of Claim 1 wherein the number of multiple cleaning cycles exercised on a particular photomask without degradation is greater than about ten cleaning cycles.
 7. A method for attenuating yield loss in fabrication of microelectronics fabrications employing phase shift photomasks by reducing defect levels in said photomasks comprising:
 - providing a phase shift photomask having patterned metal layers;

providing a phase shift photomask having patterned metal layers;
treating the phase shift photomask to a cleaning process consisting of: a
a solution of ammonium hydroxide and hydrogen peroxide in
water maintained within a constant temperature range;
ultrasonic agitation; and
an exposure time greater than about six minutes;

removing particles greater than about 0.2 microns while removing a minimal
amount of patterned metal layers; and

exercising the cleaning procedure on a particular phase shift photomask for a
multiple number of cleaning cycles without degradation of the phase shift photomask.

8. The method of claim 7 wherein the phase shift mask is formed of patterned layers of
chromium and molybdenum silicon alloy.

9. The method of Claim 7 wherein the ratio of reagents ammonium hydroxide:hydrogen
peroxide:water in the cleaning solution ranges from about 1:1:200 to about 1:1:20 by volume
respectively.

10. The method of Claim 7 whereby the minimal amount of metal layers removed by the
cleaning process is equivalent to less than about 6.3% increase in optical transmittance.

11. The method of Claim 7 whereby the constant temperature range of the cleaning solution is
from about 15 degrees centigrade to about 60 degrees centigrade.

12. The method of Claim 6 wherein the pH of the cleaning solution is maintained at an alkaline
level greater than a value of about 8.

13. The method of claim 7 wherein the number of cleaning cycles which may be exercised on a
particular phase shift photomask without degradation is greater than ten cycles.